

NOAA SCIENTIFIC PUBLICATIONS REPORT AUGUST 3, 2015

HIGHLIGHTED ARTICLES

[Mercury declines in adult bluefish \(1972-2011\) along the mid-Atlantic coast of the U.S.A.](#)

Journal of Environmental Science and Technology (5.48)

[Discovery of a novel hepatovirus \(Phopivirus of seals\) related to human hepatitis A](#)

mBio (6.786)

[Quantifying cyanobacteria and high biomass blooms from satellite to support environmental management and public use of U.S. lakes and estuaries](#)

Proceedings of the "Sentinel-3 for Science Workshop" (N/A)

[What's the catch? Validity of whaling data for Japanese catches of sperm whales in the North Pacific](#)

Royal Society Open Science (N/A)

[Measuring Changes in Multi-Factor Productivity in U.S. Catch Share Fisheries](#)

Marine Policy (2.621) -- Part of the special issue referenced below

[IFQs and total factor productivity changes: The case of the Gulf of Mexico red snapper fishery](#)

Marine Policy (2.621) -- Part of the special issue referenced below

[Public Preferences for Endangered Species Recovery: An Examination of Geospatial Scale and Non-Market Values](#)

Frontiers in Marine Science (N/A)

ADDITIONAL ARTICLES

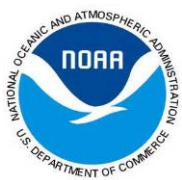
SPECIAL ISSUE IN MARINE POLICY

[Productivity Change in Commercial Fisheries: An introduction to the special issue](#)

Marine Policy (2.621)

[Fishing for common ground: Investigations of the impact of trawling on ancient shipwreck sites uncovers a potential for management synergy](#)

Marine Policy (2.621)



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Productivity growth, catchability, stock assessments, and optimum renewable resource use

Marine Policy (2.621)

Decomposing Productivity and Efficiency Changes in the Alaska Head and Gut Factory Trawl Fleet

Marine Policy (2.621)

Multifactor productivity, environmental change, and regulatory impacts in the U.S. West Coast Groundfish Trawl Fishery, 1994-2013

Marine Policy (2.621)

JOINT LINE OFFICE PUBLICATIONS

Poleward displacement of coastal upwelling-favorable winds in the ocean's eastern boundary currents through the 21st century

Geophysical Research Letters (4.456)

Seasonal sea surface temperature anomaly prediction for coastal ecosystems

Progress in Oceanography (3.986)

NMFS Publications

Geo-referenced, abundance calibrated ocean distribution of Chinook salmon (*Oncorhynchus tshawytscha*) stocks across the west coast of North America

PLOS ONE (3.53)

Patterns, duration, and timing of ontogenetic shifts in juvenile loggerhead sea turtles of the Northwest Atlantic Ocean

Ecosphere (2.595)

Effects of demineralization on the stable isotope analysis of bone samples

Rapid Communications in Mass Spectrometry (2.25)

Age and size at maturation and adult stage duration for loggerhead sea turtles in the western North Atlantic

Marine Biology (2.393)

Managing catch of marine megafauna: guidelines for setting limit reference points



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Marine Policy (2.62)

[Insights from a gray whale \(*Eschrichtius robustus*\) bycaught in the Taiwan Strait off China in 2011](#)

Aquatic Mammals (0.465)

[Can observer sampling validate industry catch reports from trawl fisheries?](#)

Fisheries Research (1.843)

[Reproductive dynamics of Pacific sanddab, *Citharichthys sordidus*, off the central coast of California](#)

Journal of Sea Research (2.366)

[Maturity and growth of darkblotched rockfish, *Sebastes crameri*, along the U.S. west coast](#)

Environmental Biology of Fishes (1.356)

[Assessment of trawlable and untrawlable seafloor using multibeam-derived metrics](#)

Methods in Oceanography (1.702)

[Somatic growth of juvenile black and yellow morphotype *Chelonia mydas* at Gorgona National Park in the Colombian Pacific](#)

Marine Biology (2.393)

[Sensitivity of the California Current nutrient supply to wind, heat, and remote ocean forcing](#)

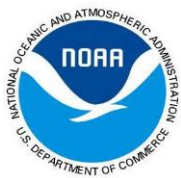
Geophysical Research Letters (4.456)

[Factors driving derelict crab pot density and bycatch composition in North Carolina](#)

Fishery Bulletin (1.783)

[Evaluating climate change impacts in the context of community interactions: application of qualitative network models to ocean acidification](#)

Marine Ecology Progress Series (2.64)



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[Developing a genetic baseline for the yellowtail amberjack species complex, *Seriola lalandi sensu lato*, to assess and preserve variation in wild populations of these globally important aquaculture species](#)

Conservation Genetics (1.85)

[Ultrasonic telemetry reveals seasonal variation in depth distribution and diel vertical migrations of sub-adult Chinook and coho salmon in Puget Sound](#)

Marine Ecology Progress Series (2.46)

[Age, growth, and natural mortality of yellowfin grouper \(*Mycteroperca venenosa*\) from the southeastern United States](#)

PeerJ (2.1)

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

NOS

[Linking landscape condition impacts to coral reef ecosystem composition for the East End of St. Croix](#)

Ocean Solutions, Earth Solutions (book from ESRI Press)

HIGHLIGHTED ARTICLES

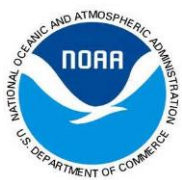
Mercury declines in adult bluefish (1972-2011) along the mid-Atlantic coast of the U.S.A.

Journal of Environmental Science and Technology (5.48)

F. A. Cross, D. W. Evans, and R. T. Barber (NCCOS/CCFHR)

- Mercury concentration in muscle of bluefish has decreased over 40% along the Atlantic coast during the past four decades
- The western Atlantic Ocean probably has been contaminated with anthropogenic sources of mercury for over 100 years
- There has been a reduction in the intake of mercury from consumption of bluefish by the public during the past 40 years.

Concentrations of total mercury were measured in muscle of adult bluefish (*Pomatomus saltatrix*) collected in 2011 off North Carolina and compared with similar measurements made in 1972. Concentrations of mercury decreased by 44% in the fish between the two time periods with a rate of decline of ~ 10%/decade. This reduction is similar to reductions of mercury observed in atmospheric deposition, riverine input, freshwater lakes and freshwater fish across northern North America. Eight other studies between 1993 and 2007 confirm the decrease in mercury levels in bluefish captured along the Mid-Atlantic Bight. The implications of these findings are 1) reductions in the release of mercury across



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northern North America were reflected rather quickly (decades) in the decline in bluefish; 2) marine predatory fish may have been contaminated by anthropogenic sources of mercury for over 100 years; and 3) if bluefish are surrogates for other predators in the Mid-Atlantic Bight, then a significant reduction in the intake of mercury by the fish-consuming public has occurred. Finally, with global emissions of mercury continuing to increase, especially from Asia, it is important that long-monitoring programs be conducted for mercury in marine fish of economic importance.

Expected Publication: TBD

Discovery of a novel hepatovirus (Phopivirus of seals) related to human hepatitis A

mBio (6.786)

S.J. Anthony, J. A. St. Leger, E. Liang, A.L. Hicks, M.D. Sanchez-Leon, K. Jain, J.H. Lefkowitz, I. Navarrete-Macias, N. Knowles, T. Goldstein, K. Pugliares, H.S. Ip, **T. Rowles**; W.I. Lipkin, (NMFS/OPR)

- Hepatitis A virus (HAV) is considered the most important viral hepatitis in humans because of the substantial number of cases in low socioeconomic regions each year, but the origin of HAV is unknown.
- Describes the discovery of a HAV-like virus in seals; the first HAV-like virus found in non-primates.
- This finding suggests that the diversity and evolutionary history of these viruses might be far greater than previously thought and may provide insight into the origin and pathogenicity of HAV.

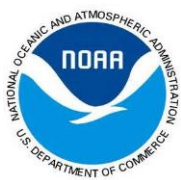
Describing the viral diversity of wildlife can provide interesting and useful insights into the natural history of established human pathogens. In this study, we describe a previously unknown picornavirus in harbor seals (named phopivirus) that is related to human hepatitis A (HAV). We show that phopivirus shares several genetic and phenotypic characteristics with HAV including phylogenetic relatedness across the genome, a specific and seemingly quiescent tropism for hepatocytes, structural conservation in a key functional region of the type III internal ribosomal entry site (IRES), and codon-usage bias consistent with that of HAV.

Accepted: 17 July 2015

Quantifying cyanobacteria and high biomass blooms from satellite to support environmental management and public use of U.S. lakes and estuaries

Proceedings of the "Sentinel-3 for Science Workshop" (N/A)

M. C. Tomlinson, R. P. Stumpf, D. Dupuy, T. T. Wynne, and Travis Briggs
(NOS/NCCOS)



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- The article demonstrates the use of an ocean color algorithm to determine cyanobacteria biomass in the form of chlorophyll *a* concentration.
- Preliminary results show that the converted chlorophyll *a* correlates well with field-extracted chlorophyll *a* in several regions of the U.S.
- The development of this algorithm and relationship to cyanobacteria biomass will be used in addressing water treatment, beach management and could also be incorporated into addressing nutrient loading and other best management practices, as they relate to the development of cyanobacteria blooms and associated negative effects.

Algal blooms of high biomass and cyanobacteria are on the rise, occurring both nationally and internationally. These blooms can foul beaches, clog water intakes, produce toxins that contaminate drinking water, and generally pose a threat to human and domestic animal health. A quantitative tool can aid in the management needs to respond to these issues, particularly because these blooms can affect many lakes within a state management district, pointing to the need for a synoptic and timely assessment. The 300 m Medium Resolution Imaging Spectrometer (MERIS) satellite imagery provided by the European Space Agency from 2002 to 2012 has led to advances in researchers' ability to monitor these systems.

Algorithms specific to quantifying high biomass blooms have been developed for use by state managers through a comparison of field radiometry, water quality, cell enumeration measurements, and remotely-sensed satellite data. These algorithms are designed to detect blooms even with atmospheric interference and suspended sediments. Initial evaluations were conducted for Florida lakes and the St. Johns River showing that cyanobacteria blooms, especially of *Microcystis*, can be identified and their biomass can be estimated (as chlorophyll concentration and other metrics). Forecasts and monitoring have been demonstrated for Lake Erie and for Florida. A multi-agency (NASA, EPA, NOAA, and USGS) project, "Cyanobacteria Assessment Network (CyAN)" intends to apply these methods to Sentinel-3 data in near real-time on a U.S. national scale, in order to support state management agencies in protecting public health and the environment.

Accepted: 12 June 2015

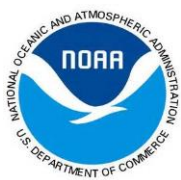
Available online:

https://drive.google.com/a/noaa.gov/file/d/0B4GwKc7NhHp_M29HaHpUSU9YYW8/view?usp=drive_web

What's the catch? Validity of whaling data for Japanese catches of sperm whales in the North Pacific

Royal Society Open Science

Y. Ivashchenko and P. Clapham (NMFS/AFSC)



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- Demonstrates that Japanese catch data for sperm whales in the North Pacific in the 1960's are not credible.
- Indicates that data currently in the IWC Catch Database are unreliable and cannot be used for population assessments.
- Implications for development of inspection procedures for any future commercial whaling.

The failure of international efforts to manage commercial whaling was exemplified by revelations of large-scale illegal whale catches by the USSR over a 30-year period following World War 2. Falsifications of catch data have also been reported for Japanese coastal whaling, but to date there has been no investigation of the reliability of catch statistics for Japanese pelagic (factory fleet) whaling operations. Here, the authors used data of known reliability from Soviet whaling industry reports to show that body lengths reported to the International Whaling Commission (IWC) by Japanese factory fleets for female sperm whales caught in the North Pacific are not credible. In 1968-1969, Japanese whaling fleets in the North Pacific killed 1,568 females, of which 97.3% were reported as being at or above the IWC's minimum length of 11.6 m (legal-sized females [LSFs]). In contrast, Soviet fleets operating during this period killed 12,578 females; only 824 of which were LSFs. Adjusting for effort, catches of LSFs were up to 9.1 times higher for Japan compared to the USSR, and even higher for very large females. Dramatic differences in body length statistics were evident when both nations operated in the same area. Significantly, the frequency of LSFs and very large females in the Japanese catch markedly declined after the IWC's International Observer Scheme in 1972 made illegal whaling more difficult. Thus, the authors conclude that the Japanese length data reflect systematic falsification of catch statistics submitted to the IWC, with serious implications for the reliability of data used in current population assessments. The apparent ease with which catch data were falsified in the past underscores the necessity of transparent and independent inspection procedures in any future commercial whaling.

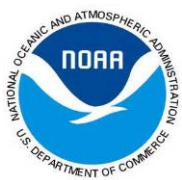
Acceptance date: 16 June 2015

Available online: 15 July 2015

Link to full text of paper: <http://rsos.royalsocietypublishing.org/content/2/7/150177>

Measuring Changes in Multi-Factor Productivity in U.S. Catch Share Fisheries Marine Policy (2.621), Special Issue: Productivity Change in Commercial Fisheries

E. Thunberg (NMFS/OST), **J. Walden** (NMFS/NEFSC), **J. Agar** (NMFS/SEFSC), **R. Felthoven** (NMFS/AKFSC), **A. Harley** (NMFS/NWFSC), **S. Kasperski** (NMFS/AKFSC), **J. Lee** (NMFS/AKFSC), **T. Lee** (NMFS NWFSC),



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A. Mamula (NMFS/SWFSC), **J. Stephen** (NMFS/SERO), and **A. Strelcheck** (NMFS/SERO)

- In this study estimates of multi-factor productivity change for 20 catch share fisheries in the U.S. using a Lowe index are provided.
- With few exceptions, productivity increased relative to baseline conditions during the first three years of catch share program implementation.
- For five of six of the most established catch share programs, these initial productivity gains have been maintained or have continued to improve.

By ending the “race to fish” catch share programs may be expected to lead to improved productivity at the fishery level by retiring redundant capital and by allowing fishing firms to become more technically efficient in their harvesting activities by, among other things, changing the composition of inputs and outputs. Yet, there have been relatively few empirical studies of productivity changes in catch share fisheries and no comprehensive treatment of a cross-section of programs using a common measure of productivity change. In this study estimates of multi-factor productivity change for 20 catch share fisheries in the U.S. using a Lowe index are provided. With few exceptions, productivity increased relative to baseline conditions during the first three years of catch share program implementation. For five of six of the most established catch share programs, these initial productivity gains have been maintained or have continued to improve.

Accepted: May 2015

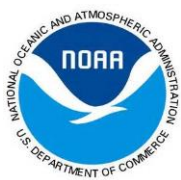
IFQs and total factor productivity changes: The case of the Gulf of Mexico red snapper fishery

Marine Policy (2.621), Special Issue: *Productivity Change in Commercial Fisheries*

D. Solis, J. J. Agar (NMFS/SEFSC), and **J. del Corral**

- The Gulf of Mexico red snapper IFQ program helped enhance fleet productivity.
- Most of the productivity gains were due to improvements in technical efficiency.
- Added productivity gains could be secured by reducing surplus capital and labor from the fishery.

This study investigates changes in the total factor productivity (TFP) and identifies the main sources of TFP growth following the adoption of an individual fishing quota (IFQ) program in the Gulf of Mexico red snapper commercial fishery. Utilizing an unbalanced panel of 722 vertical line vessels, Malmquist indices were derived from an output-oriented stochastic distance frontier. This analysis shows that the IFQ program had a positive impact on the productivity of the fleet and that most of the productivity gains were due to improvements in technical efficiency.



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The study also finds that changes in technical efficiency were time variant, suggesting that the exit of the less efficient vessels and easing of command and control regulations (e.g. trip limits, limited fishing seasons) were responsible for most of these gains. Changes in the exploitable biomass of red snapper were found to have a moderate impact on productivity growth whereas the impact of technological progress was minimal. Further gains in TFP could be secured by reducing surplus capital and labor from the Gulf of Mexico red snapper commercial fishery.

Acceptance date: June 1, 2015

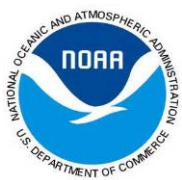
Public Preferences for Endangered Species Recovery: An Examination of Geospatial Scale and Non-Market Values

Frontiers in Marine Science (N/A)

K. Wallmo (NMFS/OST), D. K. Lew (NMFS/AFSC)

- In this paper the authors estimate non-market values for recovering eight threatened and endangered marine species managed by NMFS in the US (Humpback whale, Hawksbill sea turtle, Southern resident killer whale, Central California coast coho salmon, Southern California steelhead, Black abalone, Elkhorn coral, and Johnsons' seagrass) for two geographically embedded samples: households on the west coast of the US and households throughout the nation.
- Non-market economic values for all eight threatened and endangered marine species are positive and households are willing-to-pay a moderate amount each year to recover these species.
- There are no significant differences in non-market economic values between households residing on the west coast and a national sample of households, including values for species local to the U.S. west coast (Central California coast coho salmon, Southern California steelhead, and Black abalone)

Non-market valuation allows society to express their preferences for goods and services whose economic value is not reflected in traditional markets. One issue that arises in applying non-market values in policy settings is defining the extent of the economic jurisdiction – the area that includes all people who hold values – for a good or service. In this paper the authors estimate non-market values for recovering eight threatened and endangered marine species in the US for two geographically embedded samples: households on the west coast of the US and households throughout the nation. The authors statistically compare species values between the two samples to help determine the extent of and variation in the economic jurisdiction for endangered species recovery. These findings offer support to the tenet that the summation of non-market values across the country is



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appropriate when evaluating alternative policies for endangered species recovery.
Accepted: July 2015

ADDITIONAL ARTICLES

SPECIAL ISSUE IN MARINE POLICY

Productivity change in commercial fisheries: An introduction to the special issue
Marine Policy (2.621)

J. Walden (NMFS/NEFSC), D. Squires (NMFS/SEFSC), B. Fissel (NMFS/AKFSC), N. Vestergaard

- Introduction to the special issue of Marine Policy that features productivity analyses from a number of NMFS economists.
- Extensive review of fisheries productivity economics.

Productivity is a key economic indicator and measures the relationship between inputs used to produce a product, and the amount of product produced.

Productivity change measures how productivity has changed through time. In traditional land based industries, these two economic metrics have been extensively measured and studied. Until recently, this has not been true for commercial fishing fleets. This article provides an overview of productivity as an economic performance metric, and highlights specific studies of productivity change in commercial fisheries during the past 50 years. It concludes with an introduction to the articles contained in this special edition.

Accepted: 17 June 2015

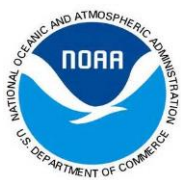
Fishing for common ground: Investigations of the impact of trawling on ancient shipwreck sites uncovers a potential for management synergy

Marine Policy (2.621)

J. S. Krumholz (NOAA Fisheries NEFSC) and M. L. Brennan

- Protecting cultural heritage sites with high density of shipwrecks can improve the ability of these sites to function as artificial reefs.
- Wrecks protected from fishing harbored higher abundance and species richness than unprotected wrecks and therefore, provide fisheries enhancement benefits as well as archaeological and cultural benefits.

Maximizing social and economic benefits from fisheries and protecting culturally significant archaeological sites are management goals often viewed to be at odds with each other. However, a potential for management synergy arises if fisheries related benefits can be associated with the protection of shipwreck sites. This study reviews fish abundance and community assemblage on several ancient shipwreck sites in the Aegean Sea. In this region, the presence or absence of fishing has been correlated to shipwreck condition. The results indicate that, on average, wrecks in worse condition (heavily fished) had 55% lower species richness, 57% lower



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abundance, and 41% lower diversity than wrecks in pristine condition, though only the patterns for abundance and species richness were statistically significant. No statistically significant change in fish community composition between fished and unfished wrecks was observed, though community composition between shallow water and deep water wrecks was statistically different. This research highlights the potential benefit of marine protected areas around areas of high density of shipwrecks that can both protect these sites and increase local fisheries by preserving these artificial reefs.

Accepted: 8 July 2015

Productivity growth, catchability, stock assessments, and optimum renewable resource use

Marine Policy (2.621)

D. Squires (NMFS/SWFSC) and Niels Vestergaard

- Growth in productivity or fishing power impacts catchability and economically optimum exploitation of marine capture fisheries.
- Stock assessments aim to remove the effect of productivity growth from stock estimates. Economists want to remove the effect of stock changes from productivity growth. An identification strategy is required to disentangle the two sources of change, often using the same fishery-dependent data.
- The North Pacific Albacore troll fishery illustrates the effects of productivity growth on economically optimum stock size.

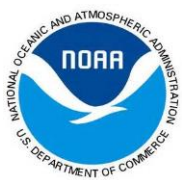
Productivity growth substantially impacts rent-maximizing resource stocks, and can lead to an economic optimum that has overfished stocks: $BMEY < BMSY$. Bioeconomic models can give biased results and policy advice when not accounting for time-varying catchability -- notably due to productivity growth -- and density-dependent catchability, and not distinguishing between fishery-dependent and fishery-independent data and implications for catchability, modeling, and applicability of results. Productivity growth, as a component of time-varying catchability, also impacts stock assessments. CPUE standardization and productivity measurement both face an identification issue in disentangling changes in resource stocks from changes in productivity as well as endogenous regressors for which there are potential identification strategies. An empirical example illustrates $BMEY < BMSY$.

Accepted: 7 July 2015

Decomposing Productivity and Efficiency Changes in the Alaska Head and Gut Factory Trawl Fleet

Marine Policy (2.621)

B. E. Fissel, R. G. Felthoven, S. Kasperski, and C. O'Donnell (NMFS/AKFSC)



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- Productivity analysis of Alaska head and gut factory trawl fleet pre- and post-catch share implementation.
- Decomposes total factor productivity into technical, environmental, and scale-mix components.
- Total factor productivity increased significantly after catch share program implementation as technical change that shifted out the production frontier

Fishing fleets are subject to numerous factors that affect economic performance, making identification and attribution of such impacts difficult. This paper separately identifies the effects of changing input and output prices, fishery management, and quota allocations on total factor productivity using a Lowe Index. Indices account for technical change and decompose efficiency estimates into its technical, environmental, and scale-mix components. This results in measures that reflect shifts in the production frontier, and movements by vessels toward and around the frontier, to capture economies of scale and mix after a policy shift to a catch share program that includes fishing cooperatives and a limited access fishery. The difference between cooperative and limited access vessels is exploited to compare the changes in economic performance between the groups after the introduction of the shift to catch shares and cooperative management, which allowed the vessels to improve the timing and coordination across multi-species fisheries and to decrease incidental catch of quota-limited bycatch species that had closed the target fisheries prematurely in the past. Results indicate that total factor productivity increased significantly after the move to a catch share program, largely due to increases in technical change that shifted out the production frontier of the fishery.

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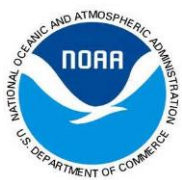
Multifactor productivity, environmental change, and regulatory impacts in the U.S. West Coast Groundfish Trawl Fishery, 1994-2013

Marine Policy (2.621)

A. Mamula (NMFS/SWFSC) and Trevor Collier

- Multifactor productivity was estimated for the U.S. West coast limited entry groundfish trawl fishery from 1994 to 2013 and decline in productivity was found from 1994 to 2002.
- Management interventions including a fisheries buyback in 2003 and catch shares in 2011 were found to enhance vessel productivity
- Productivity was found to vary across regions even after accounting for environmental and behavioral factors

This paper provides estimates of multifactor productivity for vessels participating in the West Coast Limited Entry Groundfish Trawl Fishery from 1994 to 2013. Impacts of regulatory change on productivity are examined and productivity



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dynamics are evaluated across spatial and behavioral dimensions. Results suggest four different periods of consistency: (i) a decline in productivity from 1994 - 2002, (ii) a sharp increase in productivity following a permit buyback in 2003, (iii) stagnant productivity from 2005 to 2010, and (iv) another increase in productivity following implementation of individual transferable quotas ("catch shares"). Important spatial differences in productivity are uncovered. Vessels fishing south of 40°10' N. latitude were generally less productive than those fishing north of the same line. Additionally, the productivity gap between north and south was enlarged following the policy changes (buyback in 2003 and catch shares in 2011). Productivity from 1994 to 2013 tended to be higher among vessels that were more diversified in terms of their total portfolio of commercial fishing revenue. However, productivity tended to be lower among vessels whose targeting strategies were more diversified within the groundfish fishery.

Accepted: 1 June 2015

JOINT LINE OFFICE PUBLICATIONS

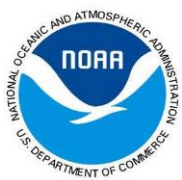
Poleward displacement of coastal upwelling-favorable winds in the ocean's eastern boundary currents through the 21st century

Geophysical Research Letters (4.456)

R. R. Rykaczewski (OAR/GFDL), J. P. Dunne (OAR/GFDL), W. J. Sydeman, M. García-Reyes, B. A. Black, and S. J. Bograd (NMFS/SWFSC)

- Ensemble of climate models were used to test Bakun hypothesis on upwelling intensification with climate change.
- Models reveal consistent poleward displacement of coastal upwelling in all eastern boundary current systems over the next century.
- Changes in the spatial structure and timing of coastal upwelling could have profound impacts on coastal marine ecosystems.

Upwelling is critical to the biological production, acidification, and deoxygenation of the ocean's major eastern boundary current ecosystems. A leading conceptual hypothesis projects that the winds that induce coastal upwelling will intensify in response to increased land-sea temperature differences associated with anthropogenic global warming. We examine this hypothesis using an ensemble of coupled, ocean-atmosphere models and find limited evidence for intensification of upwelling-favorable winds or atmospheric pressure gradients in response to increasing land-sea temperature differences. However, our analyses reveal consistent latitudinal and seasonal dependence of projected changes in wind intensity associated with poleward migration of major atmospheric high-pressure cells. Summertime winds near poleward boundaries of climatological upwelling zones are projected to intensify, while winds near equatorward boundaries are projected to weaken. Developing a better understanding future changes in



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upwelling winds is essential to identifying portions of the oceans susceptible to increased hypoxia, ocean acidification, and eutrophication under climate change. Significance of scientific conclusions for management, policy or to the broader scientific community.

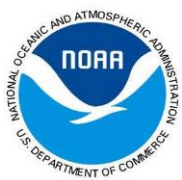
Accepted: 8 July 2015

Seasonal sea surface temperature anomaly prediction for coastal ecosystems
Progress in Oceanography (3.986)

C. Stock (OAR/GFDL), K. Pegion, G. Vecchi (OAR/GFDL), M. Alexander (OAR/ESRL), D. Tommasi (OAR/GFDL), N. Bond, P. Fratantoni (NMFS/NEFSC), R. Gudgel (OAR/GFDL), T. Kristiansen, T. O'Brien (NMFS/ST), Y. Xue (NCEP/CPC), and X. Yan (OAR/GFDL)

- This paper examines how skillful sea surface temperature (SST) anomaly predictions at marine-resource relevant scales have the potential to more broadly support dynamic management strategies for marine resources by enabling anticipatory rather than reactive marine resource management.
- While successful application of monthly to inter-annual climate forecasts to marine resource management is a multifaceted challenge, these results suggest that Large Marine Ecosystem-scale SST anomalies can serve as a robust driver of marine resource responses.

Sea surface temperature (SST) anomalies are often both leading indicators and important drivers of marine resource fluctuations. Assessment of the skill of SST anomaly forecasts within coastal ecosystems accounting for the majority of global fish yields, however, has been minimal. This reflects coarse global forecast system resolution and past emphasis on the predictability of ocean basin-scale SST variations. This paper assesses monthly to inter-annual SST anomaly predictions in coastal "Large Marine Ecosystems" (LMEs). Researchers begin with an analysis of seven well-observed LMEs adjacent to the United States and then examine how mechanisms responsible for prediction skill in these systems are reflected in predictions for LMEs globally. Historical SST anomaly estimates from the 1/4° daily Optimal Interpolation Sea Surface Temperature reanalysis (OISST.v2) were first found to be highly consistent with unprocessed in-situ measurements for six of the seven U.S. LMEs. Thirty years of retrospective forecasts from climate forecast systems developed at NOAA's Geophysical Fluid Dynamics Laboratory (CM2.5-FLOR) and the National Center for Environmental Prediction (CFSv2) were then assessed against OISST.v2. Forecast skill varied widely by LME, initialization month, and lead but there were many cases of high skill that also exceeded that of a simple persistence forecast, some at leads greater than 6 months. Mechanisms underlying skill above persistence included accurate simulation of a) seasonal transitions between less predictable locally generated and more predictable basin-



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scale SST variability; b) seasonal transitions between different basin-scale influences; c) propagation of SST anomalies across seasons through sea ice; and d) re-emergence of previous anomalies upon the breakdown of summer stratification. Globally, significant skill above persistence across many tropical systems arises via mechanisms a) and b). Combinations of all four mechanisms contribute to less prevalent but nonetheless significant skill in extratropical systems. While continued refinement of global climate forecast systems and observations are needed to improve coastal SST anomaly prediction and extend predictions to other ecosystem relevant variables (e.g., salinity), present skill warrants close examination of forecasts for marine resource applications.

Accepted: 29 June 2015

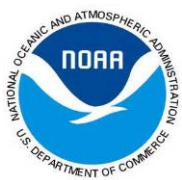
NMFS PUBLICATIONS

*Geo-referenced, abundance calibrated ocean distribution of Chinook salmon (*Oncorhynchus tshawytscha*) stocks across the west coast of North America*
PLOS ONE (3.53)

M. R. Bellinger, M. A. Banks, S. J. Bates, E. D. Crandall, J. C. Garza, G. Sylvia, **P. W. Lawson (NMFS/NWFSC)**

- In this study, ocean distribution and relative abundance of Chinook salmon (*O. tshawytscha*) stocks encountered in the California Current large marine ecosystem were inferred using at-sea catch per unit effort (CPUE) fisheries and genetic stock identification data.
- This study establishes the rationale and basis for using fine-scale effort-based indexes of local abundance to study salmon migration, and for management.
- This study provides a starting point for development of the technical tools needed for broad-scale application of genetic techniques in salmon management.

Pacific salmon (genus *Oncorhynchus*) forecasting models are used to estimate stock composition, abundance, and distribution for assessment of proposed fisheries impacts, but most models fail to account for variability in survival and the influence of biophysical factors on migratory distributions. In this study, ocean distribution and relative abundance of Chinook salmon (*O. tshawytscha*) stocks encountered in the California Current large marine ecosystem were inferred using at-sea catch per unit effort (CPUE) fisheries and genetic stock identification data. In contrast to stock distributions estimated through coded-wire-tag recoveries (typically limited to hatchery salmon), stock-specific CPUE provides information for both wild and hatchery fish. Furthermore, this metric is independent of other stocks and is easily interpreted over multiple temporal or spatial scales, in contrast



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to stock composition results. Using empirical data, the stock-specific CPUE and stock composition estimates were compared to identify conditions under which these two measures were maximally different. Samples and data used here were collected at-sea using a combination of retention and non-retention fishery sampling protocols. Understanding the effects of fishery sampling method on catch rates is important when using fishery-dependent data to infer relative stock abundances. A weak effect of fishery sampling method on catch rates was observed in some, but not all analyzed, cases. Novel visualizations of stock-specific ocean distribution patterns facilitate consideration of how highly refined, spatial and genetic information could be incorporated in ocean fisheries management systems and used to investigate oceanographic and biogeographic factors that influence migratory distributions of fish in the coastal ocean.

Expected publication date: Summer 2015

Link to full text paper:

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0131276>

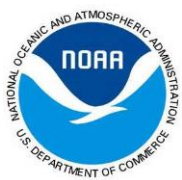
Patterns, duration, and timing of ontogenetic shifts in juvenile loggerhead sea turtles of the Northwest Atlantic Ocean

Ecosphere (2.595)

M. D. Ramirez, L. Avens, **J. A. Seminoff** (NMFS/SWFSC), L. R. Goshe, S. S. Heppell

- The authors use stable isotope analysis of annual growth layers in humerus bones to evaluate ontogenic shifts in habitat use by juvenile loggerhead turtles in the Atlantic Ocean.
- These results indicate that there are several different life-history patterns, with some turtles remaining oceanic for extended periods and other turtles moving from oceanic to neritic habitats on one or more occasions
- These data help pinpoint the extent to which individual loggerhead turtles are susceptible to spatially explicit threats.

Ontogenetic changes in resource use often delimit transitions between life stages. Individual variation in the timing of and fidelity to these transitions may be caused by ecological factors, and can ultimately affect community and population dynamics through changes in growth and survival. Therefore, it is important to document and understand behavioral and life history polymorphism, and the processes driving them. To evaluate juvenile loggerhead sea turtle (*Caretta caretta*) life history variation and to detect shifts in habitat and diet that occurred throughout an individual's lifetime, the authors sequentially analyzed the stable isotope composition of humerus bone growth increments ($n = 84$). Isotopic data showed significant increases in $\delta^{15}\text{N}$ values over one or more years, with a mean difference in pre- and post-ontogenetic shift $\delta^{15}\text{N}$ values of 4.4‰. Growth



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increment-specific $\delta^{15}\text{N}$ values were used to provide a new line of evidence that juvenile Northwest Atlantic loggerheads exhibit two major ontogenetic shift patterns: discrete shifters ($n = 23$), which complete an oceanic-to-neritic transition within one year, and facultative shifters ($n = 15$), which complete this transition over multiple years (up to five). Isotopic baseline differences between neritic and oceanic habitats in the Northwest Atlantic Ocean make it likely these patterns are driven by a coupled change in both habitat and diet, and that facultative shifters migrate between and utilize both neritic and oceanic foraging habitats within transitional growth years. Mean size and age at transition between habitats (54.1 cm straightline carapace length, SCL; 11.98 yrs) was within the range of previous estimates and did not differ between discrete (55.1 cm SCL; 12.14 yrs) and facultative shifters (53.0 cm SCL; 11.75 yrs). Our results further expand our understanding of loggerhead sea turtle behavioral polymorphisms and the role bone tissue may play in studying sea turtle life history variation. Sequential analysis of annual skeletal growth increments provides a valuable method for reconstructing long-term ontogenetic changes in foraging ecology and habitat use in long-lived, cryptic marine species.

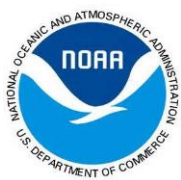
Accepted: July 2015

Effects of demineralization on the stable isotope analysis of bone samples
Rapid Communications in Mass Spectrometry (2.25)

C. N. Turner Tomaszewicz (NMFS/SWFSC), J.A. Seminoff (NMFS/SWFSC), M.D. Ramirez, and C.M. Kurle.

- This paper presents a standard protocol for treatment of modern bone samples for stable isotope analysis
- These results emphasize that pre-acidification and lipid removal of cortical bone is not required for reliable stable isotope analyses of the tissue.

The sampling of sequential, annually formed bone growth layers for stable carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) isotope analysis (SIA) can provide a predictable time series of foraging ecology data. To date, there exists no standard protocol for the pre-SIA treatment of cortical bone samples taken from fresh, modern, bone samples. Based on SIA from historical bone, it is assumed that fresh bone samples must be pre-treated with acid prior to SIA. The authors experimentally tested the need to acidify cortical bone powder with 0.25M HCl prior to SIA to isolate bone collagen for analysis of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values. The authors also examined the need for lipid extraction to remove potential biases related to $\delta^{13}\text{C}$ analysis, based on a C:N ratio threshold of 3.5. The authors found that acidification of micromilled cortical bone samples from marine turtles does not affect their $\delta^{15}\text{N}$ values, and the small effect acidification has on $\delta^{13}\text{C}$ values can be mathematically corrected, thus eliminating the need for pre-SIA acidification of cortical bone. The lipid content of



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the cortical bone samples was low, as measured by their C:N ratios, indicating lipid extracting cortical bone samples from modern marine turtles is unnecessary. This paper presents a standard protocol for treating fresh, modern bone samples prior to SIA, facilitating direct comparison of future studies. Pre-acidification and lipid removal of cortical bone is not recommended. This is especially useful as there is frequently not enough bone material removed via micromilling of sequential growth layers to accommodate both acid treatment and SIA.

Expected Publication Date: Fall 2015

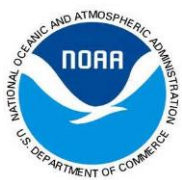
Age and size at maturation and adult stage duration for loggerhead sea turtles in the western North Atlantic

Marine Biology (2.393)

L. Avens, L. R. Goshe, L. Coggins, M. L. Snover, M. Pajuelo, K. A. Bjorndal, A. B. Bolten (NMFS/SEFSC)

- Provides information regarding range and variability for age and size at maturation, as well as reproductive longevity for loggerhead sea turtles in the western North Atlantic.
- Results indicate a wide range of potential ages and sizes at maturation and post-maturation longevity for loggerhead sea turtles, and provide first data describing maturation attributes for males.
- Growth rates back-calculated through skeletochronology demonstrate close correspondence with those measured during mark-recapture studies in the same region and show a long-term decrease in growth rates, particularly for larger juveniles, that is potentially cause for concern.

Age at maturation data are integral to understanding dynamics of threatened and endangered sea turtle populations. However, full characterization of this parameter requires information regarding variability in growth rates and both size and age at maturation potentially resulting from diverse environmental and biological influences. To address the need for these data, skeletochronological analysis was conducted for US Atlantic loggerhead sea turtles *Caretta caretta*. The influence of different covariates on back-calculated growth rates for the years 1976 – 2010 was investigated and while growth decreased overall with size and age, at larger sizes male growth rates were higher than those of females. Growth varied significantly by calendar year, increasing from 1990 to 1996/1997 and subsequently decreasing through the end of the study period. Mean sizes [cm straightline carapace length (SCL)] corresponding with the ‘rapprochement’ skeletal growth mark associated with maturation were 90.5 for females (range 75.0 - 101.3) and 95.8 for males (range 80.6 - 103.8). Ages at maturation estimated from (1) the rapprochement skeletal growth mark; (2) back-calculated SCL-at-age data; and (3) bootstrapping and fitting Fabens modified von Bertalanffy growth curve to back-calculated



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growth data were very similar among approaches, but demonstrated a wide possible range. Mean age predictions associated with minimum and mean maturation SCLs were 22.5 - 25 and 36 - 38 yr for females and 26 - 28 and 37 - 42 yr for males. Post-maturation longevity (i.e., adult stage duration) was similar for males and females, ranging from 4 – 46 yr (mean 19 yr).

Accepted: 3 July 2015

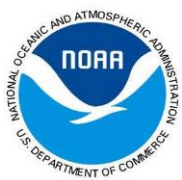
Managing catch of marine megafauna: guidelines for setting limit reference points
Marine Policy (2.62)

K.A. Curtis, J.E. Moore, C. Boyd, P.W. Dillingham, R.L. Lewison. B.L. Taylor,
and K.C. James (NMFS/SWFSC)

- Catch limit reference points may inform fisheries management decisions and support evaluation of fisheries for eco-certification or for compliance with domestic environmental protections under import certification schemes.
- These guidelines are aimed at facilitating wider application of catch limit reference points for marine megafauna and thereby advancing ecosystem-based management of fisheries.

Limit reference points (LRPs) for catch, which correspond to thresholds to undesirable population or ecosystem states, offer a consistent, objective approach to management evaluation and prioritization across fisheries, species, and jurisdictions. LRPs have been applied successfully to manage catch of some marine megafauna (elasmobranchs, marine reptiles, seabirds, and marine mammals) in some jurisdictions, such as the use of Potential Biological Removal (PBR) to manage incidental mortality of marine mammals under the U.S. Marine Mammal Protection Act. However, implementation of ecosystem-based management is still in its infancy globally, and LRPs have not yet been widely adopted for marine megafauna, particularly for incidental catch. Here, guidelines are proposed for estimating catch LRPs for marine megafauna, with particular attention to resolving common technical and political challenges, including (1) identifying management units, population thresholds, and risk tolerances that align with common conservation goals and best practices, (2) choosing catch LRP estimators, (3) estimating input parameters such as abundance and productivity, (4) handling uncertainty, and (5) dealing with mismatches between management jurisdictions and population boundaries. The problem of cumulative impacts across sectors is briefly addressed. These guidelines, grounded in marine policy, science, precedent, and lessons learned, should facilitate wider application of catch LRPs in evaluation and management of fisheries impacts on marine megafauna, in support of global commitments to conserve biodiversity and manage fisheries responsibly.

Accepted: 5 July 2015



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Insights from a gray whale (Eschrichtius robustus) bycaught in the Taiwan Strait off China in 2011

Aquatic Mammals (0.465)

X. Wang, X. Min, W. Fuxing, **D.W. Weller**, M. Xing, **A.R. Lang**, and Z. Qian (NMFS/SWFSC)

- One of only three recent records of gray whales in Chinese waters.
- Much of what we know about gray whales in the Western North Pacific is derived from long-term studies off Sakhalin Island, Russia. This record contributes to our limited understanding of the movements and distribution of gray whales in other parts of the Western North Pacific.

On 5 November 2011, a dead female gray whale entangled with set gillnet was found in the Taiwan Strait, China. Comparisons of photographs of the left side of this individual to catalogs of whales photographically identified in the eastern and western North Pacific did not identify any matches. In addition, comparison of the mtDNA control region sequence of the Taiwan Strait whale to existing mtDNA sequence datasets revealed that her haplotype has been identified in 12 whales sampled in the ENP but has not been found among sampled WNP whales.

However, photo-id and genetic datasets used to represent the WNP in these comparisons were all generated from studies of gray whales off the coast of Sakhalin Island, Russia, and from the coast of southeastern Kamchatka. Thus while these results could suggest that the Taiwan Strait whale was a vagrant from the ENP, another possibility is that an additional feeding ground (or grounds) exist in the WNP but have not yet been identified or genetically characterized. These results highlight the critical importance of obtaining photographic and genetic evidence, such as that presented here, from any gray whales recorded in areas of the WNP other than the Sakhalin feeding ground.

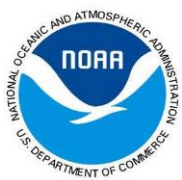
Accepted: 20 May 2015

Can observer sampling validate industry catch reports from trawl fisheries?

Fisheries Research (1.843)

C. H. Faunce (NMFS/AKFSC), J. Cahalan, J. Bonney, and **R. Swanson** (NMFS/AKFSC)

- The authors compared industry-generated reports of landed catch to independent observer estimates.
- Observers were useful to detect bias in landed catch in one fishery but were less able to detect rare species than industry in another fishery.
- The results highlight the utility of using third-party verification to improve data quality of self-reported data, and identified the logistical, database, and analytical challenges to effectively monitor fishery quotas.



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Stock assessment scientists and fishery managers operate under the necessary assumption that the identities of species and quantities of catch from industry landing reports are known without error. To evaluate this assumption, we compared industry-generated reports of landed catch to independent observer estimates. An observer sampling design for shore-based processing plants was developed and implemented at four plants in Kodiak, Alaska. A total of 13 deliveries from three fisheries were examined. Observers were able to track different portions of the catch and treat them as strata from which to randomly sample or completely enumerate. Differences between observer- and industry-derived species proportions were negligible when measured across the entire study, but differed by fishery. Industry weight in the shallow-water flatfish fishery exhibited a small negative bias not related to processor or species type. Weight differences in complete enumerations for big (*Beringraja binoculata*) and longnose skates (*Raja rhina*) were of similar magnitude but in opposite directions, leading to the conclusion that the identification of these species is confused since there is no detection error. Where observers needed to sample, they were able to detect most species in open access fisheries, with a resolution comparable to that of the industry, and were more likely to detect skates than industry. However, in the cooperative rockfish fishery, where tighter controls on the dockside sorting of fish by plant staff are in place, industry reports had enhanced detection of rare species relative to observer sampling. Notwithstanding, differences between data sources remained substantial in strata where the observer sampled even after considering rarity. The results here highlight the utility of using third-party verification to improve data quality of self-reported data, and identified the logistical, database, and analytical challenges to effectively monitor fishery quotas.

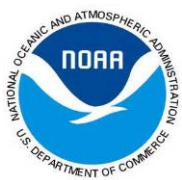
Accepted: 11 June 2015

Reproductive dynamics of Pacific sanddab, Citharichthys sordidus, off the central coast of California

Journal of Sea Research (2.366)

L. S. Lefebvre (UCSC & NMFS/SWFSC), A. M. Payne (NOAA Corps & NMFS/SWFSC), and J. C. Field (NMFS/SWFSC)

- Female Pacific sanddab were collected from Monterey Bay, CA to describe their reproductive strategy and annual reproductive cycle.
- The study found small but significant effects of maternal length on reproductive effort in fish displaying an indeterminate batch spawning strategy, which can lead to substantial differences in estimates of reproductive output between small and large females.



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- In combination with a downward shift in the length of maturity over time, these effects can lead to an altered perception of the stock's historic reproductive potential.
- This study highlights the importance of considering demographic shifts and size-related dynamics when modelling a stock's reproductive potential.

Female Pacific sanddab were collected from the Monterey Bay, California to describe their reproductive strategy and annual reproductive cycle, as well as to estimate length at maturity, fecundity, spawning fraction (SF), and spawning interval (SI). Captive females were held to examine degradation of spawning markers and confirmed the biological spawning capabilities of the species. The reproductive season extended from May through January, as determined through macroscopic and histological examination of ovaries. Oocyte development was asynchronous, and an indeterminate fecundity pattern was displayed. Absolute and relative batch fecundity values were variable (means = 6,663 eggs and 54 eggs g^{-1} somatic weight, respectively) and significantly related to maternal length. During the period of highest reproductive activity, SF ranged from 0.42 to 0.98, suggesting some females were spawning on a daily basis. Monthly SF and SI were related to length, with smaller females having a truncated season and lower SF compared to larger females. Lengths at 50% (119 mm) and 95% (149 mm) maturity showed a downward shift relative to the 1940s, though the magnitude and cause of this shift remain unknown. This study highlights the importance of considering demographic shifts and size-related dynamics when modelling a stock's reproductive potential.

Accepted: 27 June 2015

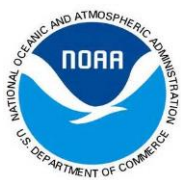
*Maturity and growth of darkblotched rockfish, *Sebastes crameri*, along the U.S. west coast*

Environmental Biology of Fishes (1.356)

P. H. Frey, M. A. Head, and A. Keller (NMFS/NWFSC)

- This paper provides an update to female maturity parameters used to assess the U.S. west coast stock of darkblotched rockfish, *Sebastes crameri*.
- Analysis is based on histological analysis of ovary specimens collected during the 2011 and 2012 Northwest Fisheries Science Center west coast groundfish bottom trawl survey.

Changes in the reproductive biology of fish stocks over time can affect the accuracy of recruitment estimates used by fisheries managers to determine harvest levels. For heavily depleted species, shifts in parameters such as age and size at maturity may occur over a relatively short time period in response to changes in



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selective pressure or population density. We examined the reproductive biology of darkblotched rockfish (*Sebastes crameri*), a commercially and ecologically important groundfish, which is currently listed as 'rebuilding' after years of intense overfishing in the 1980s and 1990s. Ovaries and age structures were collected during the 2011 and 2012 Northwest Fisheries Science Center (NWFSC) west coast groundfish bottom trawl survey. We used histological examination to classify oocyte development and maturity stages for this species. Length and age at 50% maturity were estimated as 30.0 cm fork length and 6.0 years, respectively, indicating a 12% and 29% decrease compared to the length and age at 50% maturity previously reported for this stock. This reduction moderately impacted the depletion level of spawning stock biomass in a recent darkblotched stock assessment, demonstrating the importance of periodically updating life-history data used in stock assessment models. Our study also revealed spatial patterns in darkblotched maturity along the coast, including a notable decrease in the proportion of mature fish encountered south of central Oregon, information that is also of interest to assessment scientists.

Accepted: 7 July 2015

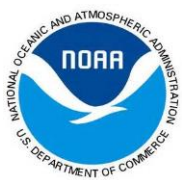
Assessment of trawlable and untrawlable seafloor using multibeam-derived metrics

Methods in Oceanography (1.702)

J. L. Pirtle (NMFS/AKFSC), T.C. Weber, **C. D. Wilson (NMFS/AKFSC)**, and **C. N. Rooper (NMFS/AKFSC)**

- This paper demonstrates a successful, high-resolution method to account for the extent of trawlable and untrawlable seafloor in the Gulf of Alaska (GOA)
- This product that can be used to estimate and map the probability of encountering trawlable and untrawlable seafloor in the GOA during ongoing fishery assessment surveys

Groundfish that associate with rugged seafloor types are difficult to assess with bottom-trawl sampling gear. Simrad ME70 multibeam echosounder (MBES) data and video imagery were collected to characterize trawlable and untrawlable areas, and to ultimately improve efforts to determine habitat-specific groundfish biomass. The data were collected during two acoustic-trawl surveys of the Gulf of Alaska (GOA) during 2011 and 2012 by NOAA Alaska Fisheries Science Center (AFSC) researchers. Multibeam-derived seafloor metrics were overlaid with the locations of previously conducted AFSC bottom-trawl (BT) survey hauls and 2011 camera stations. Generalized linear models were used to identify the best combination of multibeam metrics to discriminate between trawlable and untrawlable seafloor for the region of overlap between the camera stations or haul paths and the MBES



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data. The two best models were developed using data collected at camera stations with either oblique incidence backscatter strength (Sb) or mosaic Sb in combination with bathymetric position index and seafloor ruggedness. these described over 54% of the variation between trawlable and untrawlable seafloor types. A map of predicted seafloor trawlability produced from the model using mosaic Sb and benthic-terrain metrics demonstrated that 58% of the area mapped (5,987 square km) had > 50% probability of being trawlable and 42% of being untrawlable. The model correctly predicted 69% of trawlable and untrawlable haul locations. Successful hauls occurred in areas with 62% probability of being trawlable and gear damage occurred in areas with a 38% probability of being trawlable. This model and map produced from multibeam-derived seafloor metrics may be used to refine seafloor interpretation for the AFSC BT surveys and to advance efforts to develop habitat-specific biomass estimates for GOA groundfish populations.

Accepted: 5 June 2015

Expected Publication : 1 July 2015

Available online:

<http://www.sciencedirect.com/science/article/pii/S2211122015000225>

<http://dx.doi.org/10.1016/j.mio.2015.06.001>

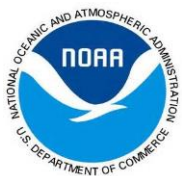
*Somatic growth of juvenile black and yellow morphotype *Chelonia mydas* at Gorgona National Park in the Colombian Pacific*

Marine Biology (2.393)

L. Sampson, A. Giraldo, L.F. Payán, D.F. Amoroch, **T. Eguchi** (NMFS/SWFSC), and **J.A. Seminoff** (NMFS/SWFSC)

- This paper reports somatic growth of two forms of green turtles in the southeastern Pacific Ocean: Gorgona National Park, Colombia
- The results provide added context for the variability in growth rates of green turtles worldwide, and provide additional evidence that green turtle growth rates are different among habitats in the eastern Pacific

Somatic growth rates of green turtles (*Chelonia mydas*) are affected by foraging success and influence their survival and reproduction. Gorgona National Park (GNP) in the Colombian Pacific (2°58'03"N, 78°10'49"W) is an insular foraging site that offers a unique opportunity to study the black (occurring only in the eastern Pacific) and yellow (with western Pacific nesting beach origins) morphotypes of green turtles during their juvenile phase. A total of 995 turtles were captured and marked between October 2003 and December 2012. Recapture rates were low (20 black turtles and 13 yellow turtles) but suggested that at least some turtles remain in the area for extended periods (>5 years). Mean growth rate was slightly higher for black turtles (mean = 0.92 ± 0.24 cm per yr) than yellow



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turtles (mean = 0.74 ± 0.26 cm per yr), and both morphotypes displayed a non-monotonic growth pattern. Black turtles grew faster at intermediate sizes, similar to black turtles at other locations in the eastern Pacific, whereas yellow turtles had slowest growth at intermediate sizes. Our data underscore the importance of GNP as a foraging habitat for *C. mydas* individuals from distinct nesting populations, and indicate that these morphotypes have different growth patterns while residing at the same foraging site.

Accepted: 27 June 2015

Sensitivity of the California Current nutrient supply to wind, heat, and remote ocean forcing

Geophysical Research Letters (4.456)

M. G. Jacox, S.J. Bograd, E. L. Hazen (NMFS/SWFSC), and Jerome Fiechter

- This paper examines the how Increased nitrate flux in the California Current over the past three decades has been driven almost entirely by enhanced equatorward winds.
- Results show how effect of surface heating (increased stratification) is much smaller and is negated by increased winds
- Wind and heat flux trends persist through basin-scale climate regime shifts, suggesting they are decoupled from decadal variability and may be secular

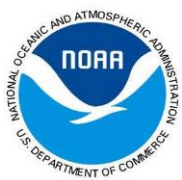
A regional ocean model is used to evaluate the roles of wind, surface heat flux, and basin-scale climate variability in regulating the upwelled nitrate supply in the California Current. A strong positive trend in nitrate flux from 1980 to 2010 was driven almost entirely by enhanced equatorward winds, negating a weak negative trend associated with increased surface heat flux. Increased upwelling and nitrate flux are consistent with cooler surface temperatures and higher phytoplankton concentrations observed over the same period. Changes in remote ocean forcing, resulting primarily from basin-scale climate variability (e.g., ENSO, PDO), drive considerable interannual fluctuations and may dominate the ecosystem response on interannual to decadal timescales. However, comparison with previously published findings suggests that local wind intensification persists through changing basin-scale climate regimes. Understanding the different timescales of variability in forcing mechanisms, and their interactions with each other, is necessary to distinguish transient ecosystem impacts from secular trends.

Accepted: 8 July 2015

Factors driving derelict crab pot density and bycatch composition in North Carolina

Fishery Bulletin (1.783)

C.M. Voss, J.A. Browder (NMFS/SEFSC), A. Wood, and A. Michaelis



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- These results may help generate fisher, public, and government awareness of the magnitude of the derelict crab pot bycatch (DCP) problem in southern North Carolina and further stimulate and accelerate efforts to reduce bycatch.
- This study may help evaluate the potential effectiveness of alternative management strategies to reduce DCP bycatch and guide strategic planning to improve fishery yields and reduce wildlife mortality attributable to DCPs.

Derelict crab pot (DCP) densities were estimated and bycatch documented in nearshore waters less than 4 m deep in six coastal waterbodies of southern North Carolina from Core Sound to the Cape Fear River. Estimated mean DCP density, 105 DCP/km², was generally higher than the density of active pots observed in the cells sampled. Density differed by basin but not among the three habitats sampled, estuarine edge, marsh creek, and margin of Intercoastal Waterway. The quantitative survey of DCP was conducted on transects using side-scanning sonar. Of the DCP examined, almost half held bycatch, and more than a third were still capable of entrapment. Bycatch included blue crabs, stone crabs, and species of concern, including Diamondback Terrapin.

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Available online: <http://fishbull.noaa.gov/1134/voss.pdf>

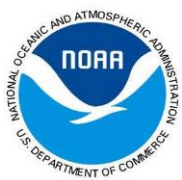
Evaluating climate change impacts in the context of community interactions: application of qualitative network models to ocean acidification

Marine Ecology Progress Series (2.46)

J. C. P. Reum, B. Ferriss, P. S. McDonald, D. Farrell, C. J. Harvey, T. Klinger, and P. S. Levin (NMFS/NWFSC)

- Provides methods and rationale for modeling ecological relationships and management actions in data-poor systems.
- Used a novel modeling system to investigate the effects of Ocean Acidification on shellfish.
- This method is a useful, if underutilized, way to predict species-level effects of OA.

Understanding the effects of ocean acidification (OA) on marine ecosystems is a major challenge, partly due to the complexity of community interactions that propagate effects and produce feedbacks that can yield unexpected outcomes. Here, the authors apply Qualitative Network Models (QNMs) to evaluate the potential implications of hypothesized OA effects on a major shellfish-producing estuary on the U.S. west coast (Willapa Bay, Washington). QNMs offer a method to formalize conceptual models of how species in a community interact. In this example, the authors synthesized current knowledge of key ecological interactions in the estuary and examined community responses to hypothesized OA effects



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including: (1) increased primary productivity, (2) reduction in bivalve populations, and (3) enhanced predation interactions between bivalves and their crab and gastropod predators. Some community members had responses that were relatively consistent regardless of OA scenario (e.g., phytoplankton, Manila clam *Venerupis philippinarum*, mud shrimp *Upogebia pugettensis*), while others showed ambiguous or variable sign responses depending on scenario. Further, they were able to identify which direct OA effects were most important in influencing the sign response of community members. QNMs can account for structural uncertainty, help identify important interactions that influence community responses to OA, and inform future research and monitoring needs. QNMs remain underutilized by OA researchers, but hold considerable promise as tools for synthesizing community interactions and predicting community-wide responses to species-level OA effects.

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Expected publication date: Fall 2015

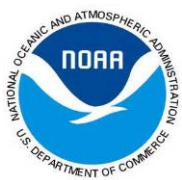
*Developing a genetic baseline for the yellowtail amberjack species complex, *Seriola lalandi* sensu lato, to assess and preserve variation in wild populations of these globally important aquaculture species*

Conservation Genetics (1.85)

C. M. Purcell, C. L. Chabot, M. T. Craig, N. Martinez-Takeshita, L. G. Allen, and J. R. Hyde (NMFS/SWFSC)

- This study provides a baseline of the existing genetic variation that exists for the yellowtail amberjack species complex.
- The equatorial region appears to be a strong dispersal barrier for these species.
- Human mediated movement of *Seriola* seed- or broodstock for sea-based aquaculture across the equator should be limited between distant geographical locations

Recent study suggest the globally distributed yellowtail amberjack, *Seriola lalandi sensu lato*, is a complex of three closely related species. Together, these and three other species of *Seriola* comprise an important component of global aquaculture production with an estimated annual value of \$1.3 billion. As yellowtail aquaculture grows, the impact of unintentional releases on wild populations has become an increasingly important issue, particularly in light of international trade of hatchery seed. To create a genetic baseline, the authors examined spatial genetic structure in 260 specimens collected from seven locations over a wide geographical range using 15 nuclear microsatellites and mitochondrial control region sequences. Overall genetic differentiation among locations, as revealed by microsatellite data, was highly significant, and pairwise estimates of divergence



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derived from mitochondrial and microsatellite data support the presence of four significantly differentiated populations corresponding to the N.E. Pacific, N.W. Pacific, S. Pacific, and South Atlantic. Based on the genetic differentiation detected in this study, and recently published sequence data, these populations more accurately reflect the presence of at least three cryptic species of *Seriola*. Especially strong genetic differentiation between hemispheres indicates that the equatorial region is a significant dispersal barrier for yellowtail amberjack, and human-mediated transport between regions should be carefully considered.

Acceptance date: 7 July 2015

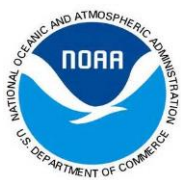
Expected publication date: TBD

Ultrasonic telemetry reveals seasonal variation in depth distribution and diel vertical migrations of sub-adult Chinook and coho salmon in Puget Sound
Marine Ecology Progress Series (2.46)

Authors: J. M. Smith, **K. L. Fresh**, **A. N. Kagley** (NMFS/NWFSC), and T. P. Quinn

- Diel vertical migrations were investigated for salmon in the Puget Sound using acoustic telemetry.
- Coho salmon showed diel vertical migrations only in the spring.
- Chinook salmon showed seasonal differences in mean depth, coinciding with chlorophyll *a* concentrations in the surface water.

Many aquatic organisms display seasonal and diel vertical migration (DVM) patterns, which are influenced by complex combinations of biotic and abiotic factors. Here, the authors examined the vertical distributions of sub-adult coho *Oncorhynchus kisutch* and Chinook salmon *O. tshawytscha* in Puget Sound, Washington, USA, using acoustic telemetry to (1) compare the depths occupied by each species, (2) determine whether DVM occurred, (3) ascertain if depth distributions changed seasonally, and (4) consider hypotheses regarding abiotic and biotic factors that could affect these behavior patterns. Coho salmon spent more time near the surface than Chinook salmon overall, and exhibited DVM during the spring, being farther below the surface at night and closer during the day. This reversal of the typical DVM pattern was not evident in other seasons. Chinook salmon showed no evidence of diel movement, only a seasonal shift from being closest to the surface in spring, deeper in summer, deeper yet in fall, and deepest in winter. The proximity of Chinook salmon to the surface coincided with peak productivity measured as chlorophyll *a*, which could affect the salmon through decreased water clarity or some ecological process. The DVM exhibited by coho salmon in spring may be related to water clarity and avoidance of predatory mammals but these hypotheses could not be tested with the available



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data. These results emphasize the complexity of diel activity patterns among closely related species, and even among individuals.

Acceptance date: 02/01/2015

Expected publication date: Summer 2015

Age, growth, and natural mortality of yellowfin grouper (Mycteroperca venenosa) from the southeastern United States

PeerJ (2.1)

M. L. Burton, J. C. Potts (NMFS-SEFSC), and D. R. Carr

- Presents the first estimates of age and growth parameters for an important species of the snapper-grouper complex from SE US territorial waters.
- Parameter estimates and demographics are compared with previously derived estimates from Caribbean populations to determine the appropriateness of applying parameters from populations with adequate data to data poor populations, such as those in the U. S. Caribbean.

Ages of yellowfin grouper ($n = 306$) from the southeastern United States coast from 1979-2014 were determined using sectioned sagittal otoliths. Opaque zones were annular, forming between January-June and peaking in February-March. Yellowfin grouper ranged in age from 3 - 31 years; the largest fish measured was 1000 mm fork length (FL). Body size relationships, von Bertalanffy growth equation, and a point estimate of natural mortality for yellowfin grouper ($M = 0.14$) were estimated from this data. The overall landings of this species in the commercial and recreational fisheries make it an unlikely candidate for a stock assessment through the NMFS SEDAR. However, these data could be useful for their application to studies of the population dynamics of US Caribbean stocks (US Virgin Islands and Puerto Rico), which is typically a data-poor region. Studies from the SE US could be used as proxies in analyses for the region.

Acceptance date: 6/20/2015

Available online: <https://peerj.com/articles/1099.pdf>

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

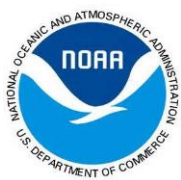
NOS PUBLICATIONS

Linking landscape condition impacts to coral reef ecosystem composition for the East End of St. Croix

Ocean Solutions, Earth Solutions (book from ESRI Press)

D. S. Dorfman, S. J. Pittman, S. D. Hile, C. F.G. Jeffrey, A. Clarke, and C. Caldwell (NCCOS/CCMA)

- The authors identified 1) terrestrial areas which are expected to have significant negative impacts on coral reef ecosystems, 2) marine areas where



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species sensitive to pollution and sedimentation occur, and described benthic fauna composition for East End Marine Park.

- This research managers of the East End Marine Park with indications of where sensitive species are most vulnerable and where watersheds are in greatest need of management to reduce impacts to marine resources.

In this land-sea characterization, the authors endeavored to map spatial patterns of the connections between actions on land and impacts at sea. Specifically, they analyzed 2007 land-cover data, evaluated land use patterns, and applied a Landscape Development Intensity Index (LDI) for watersheds adjacent to the East End Marine Park of St. Croix, U.S. Virgin Islands. They then correlated the distribution of benthic species and coral reef habitats within 300-meter buffer watershed impact zone with the LDI to identify and explore potential linkages between land-use patterns and ecological impacts on coral reefs. They compared the benthic habitat composition of watershed impact zones within classes of anticipated impacts from land-based sources of pollution. This was done using benthic habitat data both from benthic habitat maps and in- water surveys. The benthic habitat maps indicated a positive correlation between LDI and seagrass presence and a negative correlation between LDI and coral cover. The in-situ surveys revealed higher coral cover in medium impact classes compared with high and low. While the results from comparing benthic habitat maps and in-situ surveys are inconsistent, the authors anticipate that this could be due to the low number and uneven distribution of the in-water surveys. Additionally, they identified watersheds where species known to be susceptible to land-based sources of pollution are located. The process described is intended to evaluate potential linkages between landscape condition and marine ecosystem condition. The authors expect that the methods described could be employed to track the impacts of land-based sources of pollution on benthic habitats and species composition in the nearshore environment.

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